CSC 3110
Section 001
Algorithm Design and Analysis
Fall 2017
0213 STAT
T Th 05:30 PM - 06:45 PM

Instructor:
Name: Seyed Ziae Mousavi Mojab
Email: dx6565@wayne.edu

Grader:
Name: Deng Pan
Office hours: Tuesdays: 10:30 AM - 11:30 AM
Office address: Room 2207, Maccabees Building

Office hours: Fridays: 4:00 PM - 6:00 PM
Office address: Room 3211, Maccabees Building
Email: fy4802@wayne.edu

Course Description:
Formal techniques to support design and analysis of algorithms: underlying mathematical theory and practical considerations of efficiency. Topics include asymptotic complexity bounds, techniques of analysis, algorithmic strategies, advanced data and file structures, and introduction to automata theory and its application to language translation.

This is an undergraduate course on the design and analysis of algorithms. In this course, we will evaluate the efficiency of various algorithms via a mathematical analytical framework known as asymptotic analysis. We cover general algorithmic design approaches and their application to various computational problems. We also examine some advanced data structures that facilitate efficient algorithm design. The final portion of the class will explore classifications of computational problems according to their relative difficulty and techniques for dealing with the “hard” class of problems. The class is required for the Bachelor of Science in Computer Science degree program.
Credit Hours:
3 Credit Hours (Lecture only)
Prerequisite:
CSC 2200 and CSC 2201 (both with grade of C or better); MAT 2020 and BE 2100 (both with grades of C-minus or better).
Co-requisites:
None.
Text(s) Book:
Course Contents:
1. Fundamentals of the Analysis of Algorithm Efficiency.
2. Brute Force and Exhaustive Search.
3. Decrease-and-Conquer.
5. Transform-and-Conquer.
8. Greedy Technique.
9. Iterative Improvement.
10. Limitations of Algorithm Power.
11. Coping with the Limitations of Algorithm Power.
Course Learning Objectives:
Upon successful completion of this class, the student will be able to:
1. Define the various types of efficiency (e.g., time and space) and types of analysis (best, worst, and average case).
2. Understand and use the formal definitions of asymptotic analysis (i.e., Big-O, BigOmega, and Big-Theta) to derive upper and lower bounds on an algorithm's complexity.
3. List and contrast standard complexity classes.
4. Use and solve recurrence relations to determine the time complexity of recursively defined algorithms.
5. Use and solve summations to determine the time complexity of iterative (non-recursive) algorithms.
6. Describe and apply (to appropriate problems) the following algorithm design strategies: brute-force and exhaustive search, decrease-and-conquer, divide-and-conquer, transform and-conquer, dynamic-programming, the greedy-choice rule, and iterative improvement.
7. Analyze the time-space trade-offs of algorithms.
8. Define and explain the significance of the classes P, NP, and NP-Complete.
9. Describe and apply algorithm design strategies for dealing with intractable problems (e.g., backtracking, approximation, etc.)
Assessment:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>(8 x 30 = 240 points)</th>
<th>24%</th>
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<tbody>
<tr>
<td>Attendance &amp; participation</td>
<td>(10 x 10 = 100 points)</td>
<td>10%</td>
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<tr>
<td>Mid Term</td>
<td>(2 x 200 = 400 points)</td>
<td>40%</td>
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<tr>
<td>Final Exam</td>
<td>(1 x 260 = 260 points)</td>
<td>26%</td>
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Total 1000 points

Note: There will be 10 assignments in total. The two lowest scores will be dropped.

Web Site
Supplementary information for the course is available at http://blackboard.wayne.edu. Log on with your Access ID for class notes, lecture slides, class announcements, the course syllabus, and other information for the course. You will submit your assignments and check grades there too.

E-Mail
All students are requested to access their Wayne State e-mail account regularly. You may be contacted when important matters arise. If you have any questions about the course or need assistance, please contact the instructor and/or the TA in person during office hours or by e-mail at any time.

Grading Scale:
The grades for the course will be based upon the percentages given below:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100%</td>
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<tr>
<td>A-</td>
<td>87-89%</td>
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<tr>
<td>B+</td>
<td>84-86%</td>
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<tr>
<td>B</td>
<td>80-83%</td>
</tr>
<tr>
<td>B-</td>
<td>77-79%</td>
</tr>
<tr>
<td>C+</td>
<td>74-76%</td>
</tr>
<tr>
<td>C</td>
<td>70-73%</td>
</tr>
<tr>
<td>C-</td>
<td>67-69%</td>
</tr>
<tr>
<td>D+</td>
<td>64-66%</td>
</tr>
<tr>
<td>D</td>
<td>60-63%</td>
</tr>
<tr>
<td>D-</td>
<td>57-59%</td>
</tr>
<tr>
<td>F</td>
<td>0 - 56%</td>
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Course Policies:

1. Lecture attendance is mandatory. If you need to miss a lecture (for a valid reason recognized by the University), you must notify me in advance of the lecture.
2. Cheating of any kind is not allowed and will be handled in accordance with University Policy. Discussion of assignments, without copying of information, is permitted. Grader is available for help during her/his office hours.
3. Students are encouraged to participate.
4. All exams are in-class, and closed-book and closed-notes.
5. No make-up exams will be given except for university sanctioned excused absences. If you miss an exam (for good reasons). It is your responsibility to contact me before the exam, or soon after the exam as possible.
6. You are responsible to check your grades after each assignment, and report an inconsistent grade to the grader no later than 7 days after the grade was assigned. After 7 days from posting it on Blackboard, the grade will become final.
7. No late submission for assignment will be accepted.

<table>
<thead>
<tr>
<th>On Due Date</th>
<th>Next Day</th>
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<tbody>
<tr>
<td>0 deduction</td>
<td>100% deduction</td>
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8. Assignment Submission format:
   - All assignments must be submitted by the Blackboard. No email or hard copy is accepted.
   - The homework should be submitted to the Blackboard in PDF format. Don’t use the text box on the blackboard to answer the questions or to write comments, we will not read it.
   - State your answer clearly.
   - If your assignment requires more than one file include all files in one folder and compressed (zipped) your folder.
   - Use this format to name your file (firstName_LastName_AssignmentNumber).
   - I strongly suggest you submit it at least 10 minutes earlier in case any kind of accidents would happen like network delay.

Religious Holidays:

Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.
Student Disabilities Services:

• If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located in the Adamany Undergraduate Library. The SDS telephone number is 313-577-1851 or 313-202-4216 (Videophone use only). Once your accommodation is in place, someone can meet with you privately to discuss your special needs. Student Disability Services’ mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

• Students who are registered with Student Disability Services and who are eligible for alternate testing accommodations such as extended test time and/or a distraction-reduced environment should present the required test permit to the professor at least one week in advance of the exam. Federal law requires that a student registered with SDS is entitled to the reasonable accommodations specified in the student’s accommodation letter, which might include allowing the student to take the final exam on a day different than the rest of the class.

Academic Dishonesty - Plagiarism and Cheating:
Academic misbehavior means any activity that tends to compromise the academic integrity of the institution or subvert the education process. All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct (http://www.doso.wayne.edu/student-conduct-services.html). Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.

• **Cheating:** Intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information or assistance in any academic exercise. Examples include: (a) copying from another student’s test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.

• **Fabrication:** Intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the source indicated; (b) listing sources in a bibliography not used in a research paper.

• **Plagiarism:** To take and use another’s words or ideas as one’s own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.

• **Other** forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student’s access to educational resources, or any attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student;
(d) selling, buying or stealing all or part of an un-administered test or answers to the test;
(e) changing or altering a grade on a test or other academic grade records.

Course Drops and Withdrawals: In the first two weeks of the (full) term, students can drop this
class and receive 100% tuition and course fee cancellation. After the end of the second week there
is no tuition or fee cancellation. Students who wish to withdraw from the class can initiate a
withdrawal request on Pipeline. You will receive a transcript notation of WP (passing), WF
(failing), or WN (no graded work) at the time of withdrawal. No withdrawals can be initiated after
the end of the tenth week. Students enrolled in the 10th week and beyond will receive a grade.
Because withdrawing from courses may have negative academic and financial consequences,
students considering course withdrawal should make sure they fully understand all the
consequences before taking this step. More information on this can be found at:
http://reg.wayne.edu/pdf-policies/students.pdf

Student services:
• The Academic Success Center (1600 Undergraduate Library) assists students with content
  in select courses and in strengthening study skills. Visit www.success.wayne.edu for
  schedules and information on study skills workshops, tutoring and supplemental instruction
  (primarily in 1000 and 2000 level courses).
• The Writing Center is located on the 2nd floor of the Undergraduate Library and provides
  individual tutoring consultations free of charge. Visit http://clasweb.clas.wayne.edu/
  writing to obtain information on tutors, appointments, and the type of help they can provide.

Class recordings:
Students need prior written permission from the instructor before recording any portion of this
class. If permission is granted, the audio and/or video recording is to be used only for the student’s
personal instructional use. Such recordings are not intended for a wider public audience, such as
postings to the internet or sharing with others. Students registered with Student Disabilities
Services (SDS) who wish to record class materials must present their specific accommodation to
the instructor, who will subsequently comply with the request unless there is some specific reason
why s/he cannot, such as discussion of confidential or protected information.